IN THE CLAIMS

1. (Previously Presented) A method of solving an operations problem, the operations problem comprising a scheduling problem in a particular business operation, comprising:

receiving variables, relationships, and constraints relating to the scheduling problem;

forming a set of non-convex quadratic equations based on the variables, relationships, and constraints;

solving the set of non-convex quadratic equations by applying a bound propagation process, a local linear bounding process, a local linearization process, and a global subdivision search; and

determining whether a solution to the scheduling problem is optimal, feasible, or infeasible.

2. (Original) The method of claim 1, wherein the solution is a schedule for a manufacturing process.

3. (Original) The method of claim 2, wherein the solution is a schedule for operating an oil refinery.

4. (Original) The method of claim 1, wherein the solution is a plan for a manufacturing process.

5. (Original) The method of claim 4, wherein the solution is a plan for operating an oil refinery.

6. (Previously Presented) A machine-accessible medium having associated content capable of directing the machine to perform a method of solving a set of non-convex quadratic equations relating to a scheduling problem in a particular business operation, the method comprising:

selecting a region bounding all variables relating to the scheduling problem;

applying a bound propagation process to the region to refine the bounds and improve linearization;

applying a local linear bounding process to the region to determine feasibility and to find approximately feasible solutions to the scheduling problem;

applying a local linearization process to the region to determine feasibility and local optimality;

upon finding an optimal global solution to the scheduling problem, providing the optimal global solution and information indicating optimality;

upon finding a feasible global solution to the scheduling problem, providing the feasible global solution to the scheduling problem and information indicating feasibility;

upon determining local infeasibility, eliminating the region from consideration;

upon determining global infeasibility, providing information indicating infeasibility; and

upon not finding a solution to the scheduling problem, applying a global subdivision search to the region to produce two or more regions and iteratively applying the bound propagation, local linear bounding, and local linearization processes to each of the two or more regions, until determining the solution to the scheduling problem is optimal, feasible, or infeasible.

7. (Original) The machine-accessible medium as recited in claim 6, further comprising: receiving input variables, constraints, and equations.

8. (Original) The machine-accessible medium as recited in claim 6, further comprising: receiving a measure of optimality used to determine the global optimal solution.

9. (Original) The machine-accessible medium as recited in claim 6, further comprising: receiving a measure of feasibility used to determine the global feasible solution.

10. (Original) The machine-accessible medium as recited in claim 6, further comprising: providing a schedule for operating a plant.

11. (Original) The machine-accessible medium as recited in claim 6, further comprising:

providing a plan for operating a plant.

12. (Previously Presented) A process of solving a set of non-convex quadratic equations relating to a scheduling problem in a particular business operation, comprising:

selecting a region bounding all variables relating to the scheduling problem;

applying a bound propagation process to the region to refine the bounds and improve linearization;

applying a local linear bounding process to the region to determine feasibility and to find approximately feasible solutions to the scheduling problem;

applying a local linearization process to the region to determine feasibility and local optimality;

upon finding a solution to the scheduling problem after the local linearization process, providing the solution;

upon determining infeasibility, eliminating the region from consideration; and

upon not finding the solution to the scheduling problem after the local linearization process, applying a global subdivision search to the region to produce two or more regions and iteratively applying the bound propagation, local linear bounding, and local linearization processes to each of the two or more regions, until determining the solution to the scheduling problem is optimal, feasible, or infeasible.

13. (Original) The process as recited in claim 12, wherein the local linearization process is the local linear bounding process.

14. (Original) The process as recited in claim 12, wherein the local linear bounding process comprises:

performing differentiation on equations in the region;

determining lower and upper bounds on the variables in the region;

applying a linear programming process to the linear equations in the region;

determining whether a solution exists in the region;

upon finding a solution exists, determining local feasibility; and

upon finding local infeasibility, determining global infeasibility.

15. (Original) The process as recited in claim 12, wherein the local linearization process comprises:

performing differentiation at a point in the bounded region;

forming a set of linear equations;

applying a linear programming process to the linear equations in the bounded region; and

generating a new point in the bounded region and repeating the local linearization process with the new point.

16. (Original) The process as recited in claim 12, wherein applying a global subdivision search to the region to produce two or more regions comprises:

maintaining a list of non-closed nodes;

selecting a candidate set of nodes from the list;

selecting a chosen node from the candidate set;

subdividing a point range of the chosen node;

closing the chosen node; and

opening two new nodes that subdivide the chosen node.

17. (Original) The process as recited in claim 16, wherein selecting the candidate set of nodes is done by selecting linearized nodes.

18. (Original) The process as recited in claim 16, wherein selecting the candidate set of nodes is done by expanding nodes that have not yet been partially expanded.

19. (Original) The process as recited in claim 16, wherein selecting the candidate set of nodes is done by selecting expanded nodes.

20. (Original) The process as recited in claim 16, wherein subdividing the two new nodes

that subdivide the chosen node comprises:

subdividing a point range;

upon determining the chosen node is linearized and divergent, computing a worst divergence; and

upon determining the chosen node is not linearized, computing a dimension of largest infeasibility.